

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

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|--|--|---|
| Applicant's or agent's file reference 5093-024 | FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below. | |
| International application No. PCT/US2004/026458 | International filing date (day/month/year) 12/08/2004 | (Earliest) Priority Date (day/month/year) 19/08/2003 |
| Applicant IRIDIGM DISPLAY CORPORATION | | |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box II).

3. ☐ **Unity of invention is lacking** (see Box III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regards to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 3

☐ as suggested by the applicant.

☒ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

- b. ☐ none of the figures is to be published with the abstract.

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G02B26/00 G01J3/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G02B G01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|---------------------------|
| X | US 2002/015215 A1 (MILES MARK W) 7 February 2002 (2002-02-07) figure 2a column 5, line 1 - line 3 ----- | 1-15 |
| X | US 5 835 255 A (MILES MARK W) 10 November 1998 (1998-11-10) figure 28a ----- | 1,2,11, 12 |
| X | US 6 407 851 B1 (KUDITCHER AMOS ET AL) 18 June 2002 (2002-06-18) column 6, line 2 - line 6 figure 2 ----- | 1-5 |
| X A | US 6 055 090 A (MILES MARK W) 25 April 2000 (2000-04-25) figure 9 ----- -/-- | 1,2,11, 12,15 16-33 |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

12 November 2004

Date of mailing of the international search report

26/11/2004

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2004/026458

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| P,X | DE 102 28 946 A (UNIV BREMEN) 22 January 2004 (2004-01-22) figures 1a,1b ----- | 1-5,11, 12,14 |

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/026458

| Patent document cited in search report | | Publication date | Patent family member(s) | Publication date |
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INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/US2004/026458

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
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PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2004/026458

International filing date (day/month/year)
12.08.2004

Priority date (day/month/year)
19.08.2003

International Patent Classification (IPC) or both national classification and IPC
G02B26/00, G01J3/26

Applicant
IRIDIGM DISPLAY CORPORATION

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2004/026458

Box No. II Priority

1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|---------------|
| Novelty (N) | Yes: Claims | 5,8-10,16-33 |
| | No: Claims | 1-4,6,7,11-15 |
| Inventive step (IS) | Yes: Claims | 16-33 |
| | No: Claims | 1-15 |
| Industrial applicability (IA) | Yes: Claims | 1-33 |
| | No: Claims | |

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents :

D1: US-A-2002015215
D2: US-A-5835255
D3: US-A-6055090
- 2.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.
- 2.2 The document D1 discloses (figure 1B ; the references in parentheses applying to this document) a light modulator, comprising:
a mirror (100) having first and second surfaces suspended over a cavity arranged under the first surface;
supports (tethers 102) attached to the second surface of the mirror;
support posts (104) suspending the mirror over the cavity by the supports, the support posts and supports being formed from a same layer of material (see figure 7A for instance); and
an electrode (bottom electrode 504, see figure 5A) and an optical stack (comprising layer 502 and substrate) positioned opposite the first surface across the cavity from the mirror such that activation of the electrode causes the mirror to move towards the electrode (see figures 5A and 5B), changing dimension and interference properties of the cavity.
- 2.3 Hence the subject-matter of claim 1 is not new (Article 33(2) PCT).
- 2.4 The applicant should be aware that the subject-matter of claim 1 is also not new with respect to document D2 (figure 28A) and document D3 (figure 9).
3. The subject-matter of independent product claim 6 is not new (Article 33(2) PCT), because document D2 (figure 20B) discloses a light modulator, comprising in particular, support posts (504) suspending the mirror over the cavity by the supports, the support posts having support post plugs;

4. The subject-matter of independent product claim 11 is not new (Article 33(2) PCT), because document D1 (figure 4C, for instance) discloses a light modulator, comprising in particular, a bus structure attached to the support posts adjacent to the second surface of the mirror.
5. The subject-matter of independent product claim 15 is not new (Article 33(2) PCT), because document D3 (figure 9) discloses an array of light modulators, comprising at least three modulators arranged so as to form one resulting picture element; each modulator comprising a mirror suspended over a cavity by supports, the supports formed such that each modulator corresponding to each color assumes a quiescent state corresponding to a cavity with a different dimension (see column 4, lines 25-29).
6. The additional features of dependent product claims 2-5, 7-10, 12-14 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty or inventive step, the reasons being as follows:
 - 6.1 The additional features of dependent device claims 2-4 and 12-14 are disclosed in document D1 (see paragraph [0041], in particular). The subject-matter of claims 2-4 and 12-14 is therefore not new (Article 33(2) PCT).
 - 6.2 The additional feature of claim 5 does not appear to involve any further inventive step. Hence the subject-matter of claim 5 lacks an inventive step (Article 33(3) PCT).
 - 6.3 Document D2 discloses a bus structure attached to the support posts adjacent to the second surface of the mirror (figure 20B). Hence the subject-matter of claim 7 is not new (Article 33(2) PCT).
 - 6.4 The additional features of claims 8-10 are disclosed in D1 (paragraph [0041]). The subject-matter of claims 8-10 lacks therefore an inventive step (Article 33(3) PCT).
- 7.1 Independent method claims 16, 23 and 30 appear to be new and inventive (Article 33(2) and (3) PCT).

- 7.2 Document D3, which is considered to represent the most relevant state of the art, discloses (figures 10a to 10d and 11a to 11d) a method of manufacturing a light modulator, from which the subject-matter of claim 16 differs in :
- depositing a second sacrificial layer upon the mirrors;
 - using a planarization layer to form support post plugs;
 - depositing a flexible layer on the support post plugs and forming attachments between the flexible layer and the mirror ;
- 7.3 The subject-matter of claim 16 is therefore novel (Article 33(2) PCT).
- 7.4 The problem to be solved by the present invention may therefore be regarded as how to manufacture better light modulator, in preventing degradation of the interference properties of the cavity around the edges of the observed pixels (see description page 5, lines 8-12). The solution to this problem proposed in claim 16 of the present application is considered as involving an inventive step (Article 33(3) PCT).
8. Independent method claims 23 and 30 are also new and inventive (Article 33(2) and (3) PCT) for the reason given in paragraph 7.2 to 7.4, *mutatis mutandis*.
9. Claims 17-22, 24-29, 31-33 are dependent on claims 16, 23 or 30 and as such also meet the requirements of the PCT with respect to novelty and inventive step (Article 33(2) and (3) PCT).